Structural Integrity Monitoring for Improved Drinking Water Infrastructure Sustainability

Michael D. Royer
Physical Scientist
UWMB/NRMRL/ORD
(732) 321-6633
royer.michael@epa.gov

Key Words: infrastructure, drinking water quality, potable water distribution, sustainability, structural integrity

Structural integrity monitoring (SIM) is the systematic detection, location, and quantification of pipe wall damage or associated indicators. Each of the adverse situations below has the potential to be reduced by more effective and economical SIM of water mains:

- the drinking water infrastructure funding gap
- inefficient scheduling of water main repair, rehabilitation, and replacement
- excess leakage
- water main breaks and their effects including pressure loss; contaminant backflow and intrusion; waterborne disease outbreaks; boil water orders; water supply depletion and disruption; costs for emergency response, damages, and liability; and deferrals of planned maintenance.

Effective SIM characterizes the present structural state of the water mains, which enables the identification and prevention of many imminent failures. Effective SIM of the same location over time enables deterioration rate estimation. For mains in which measured structural parameter values correlate well with high probabilities of failure, SIM data can be used to estimate remaining service life and thus optimize scheduling of repair, rehabilitation, and replacement. Effective SIM is difficult for drinking water distribution systems, which are often large, buried and inaccessible, and variable in composition and condition. Existing SIM approaches for water mains have many deficiencies. Some research is underway, but many useful applications and promising options remain unaddressed.

Numerous opportunities for improving SIM capability for water mains are arising from SIM components and systems developed for a wide range of other applications. For example, sensors are being improved with regard to sensitivity, coverage, speed, durability, reliability, size, energy requirements, and cost. New SIM technologies offer a rich source of potential opportunities for expanding and accelerating the SIM capability for water mains.

This poster will describe EPA-ORD efforts and opportunities to significantly accelerate improvement of SIM for water mains applications by (1) working with the user community to define performance and cost targets for classes of next-generation SIM systems for water mains; (2) increasing the emphasis of existing, relevant EPA-ORD research programs on SIM improvement needs not addressed by the private sector; (3) collaborating with other Federal agencies that are developing or using SIM procedures or technology potentially applicable to water mains; and (4) continuing close coordination and collaboration with user community

research organizations. The market place will ultimately select the SIM capability winners and losers, but Federal research participation can significantly improve the options available for effective, safe, and sustainable management of drinking water distribution mains.